

INSTRUCTION MANUAL
FOR THE
OBLIQUE DRIVE
B CONFIGURATION

31 AUGUST 1956

5147-25-9-56

COPY NO. 22

OBLIQUE DRIVE**TABLE OF CONTENTS**

Section		Page
I	DESCRIPTION	1
1-1.	General	1
1-2.	Major Components	1
	Oblique Drive Motor	1
	Oblique Drive Belt	3
	Oblique Drive Idler Pulley Assembly	3
	Detent Brake Assembly	3
	Detent Ring	3
	Oblique Drive Motor Mounting Bracket	3
	Oblique Drive Belt Pre-load Spring Assembly	3
	Seeker Switch and Cam Assembly	6
	Oblique Limit Switches	6
1-3.	Leading Particulars	6
	Oblique Positions	6
	Motor Data	8
	Solenoid Data	8
	Power Requirement	8
II	THEORY OF OPERATION	11
2-1.	General	11
2-2.	Mode 1 Operation	11
2-3.	Mode 2 Operation	13

B CONFIGURATION**TABLE OF CONTENTS (Cont'd)**

Section	Page
III PREPARATION FOR OPERATION	17
3-1. General	17
IV MAINTENANCE	19
4-1. General	19
4-2. Special Tools	19
4-3. Lubrication	19
4-4. Periodic Inspection	19
V OVERHAUL	21
5-1. General	21
VI PARTS LIST	23

ILLUSTRATIONS

Figure	Page
1-1. Oblique Drive, B Configuration	vi
1-2. Oblique Drive Motor	2

OBLIQUE DRIVE

ILLUSTRATIONS (Cont'd)

Figure		Page
1-3.	Oblique Drive Idler Pulley Assembly	4
1-4.	Detent Brake Assembly	5
1-5.	Detent Ring	7
1-6.	Seeker Switch Assembly	9
2-1.	Oblique Drive, B Configuration, Electrical Schematic	12a
2-2.	Mode 1 Oblique Sequence Chart	14
2-3.	Mode 2 Oblique Sequence Chart	15

B CONFIGURATION

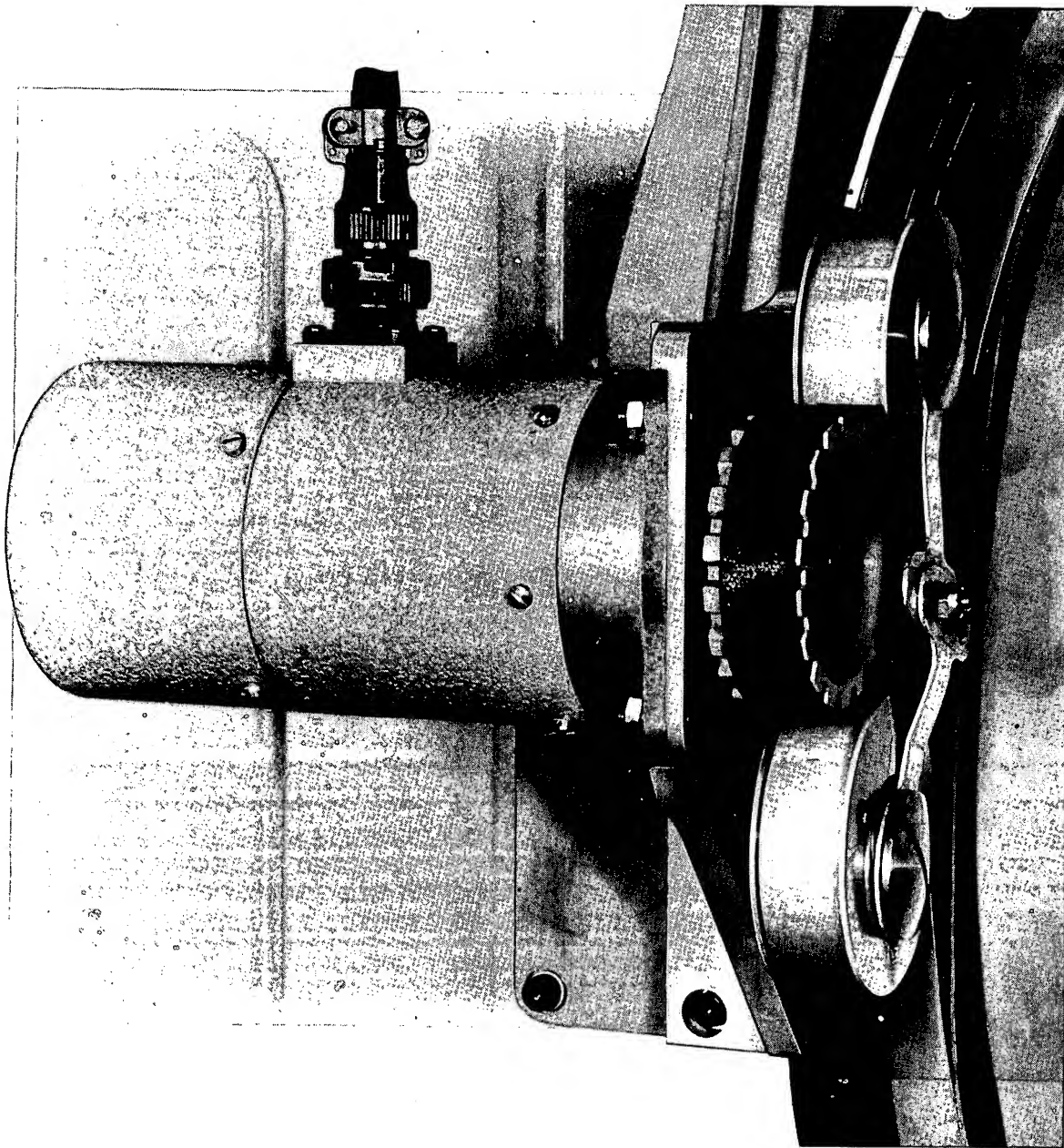


Figure 1-1. Oblique Drive, B Configuration

OBLIQUE DRIVE

Section I

DESCRIPTION

1-1. GENERAL (See figure 1-1.)

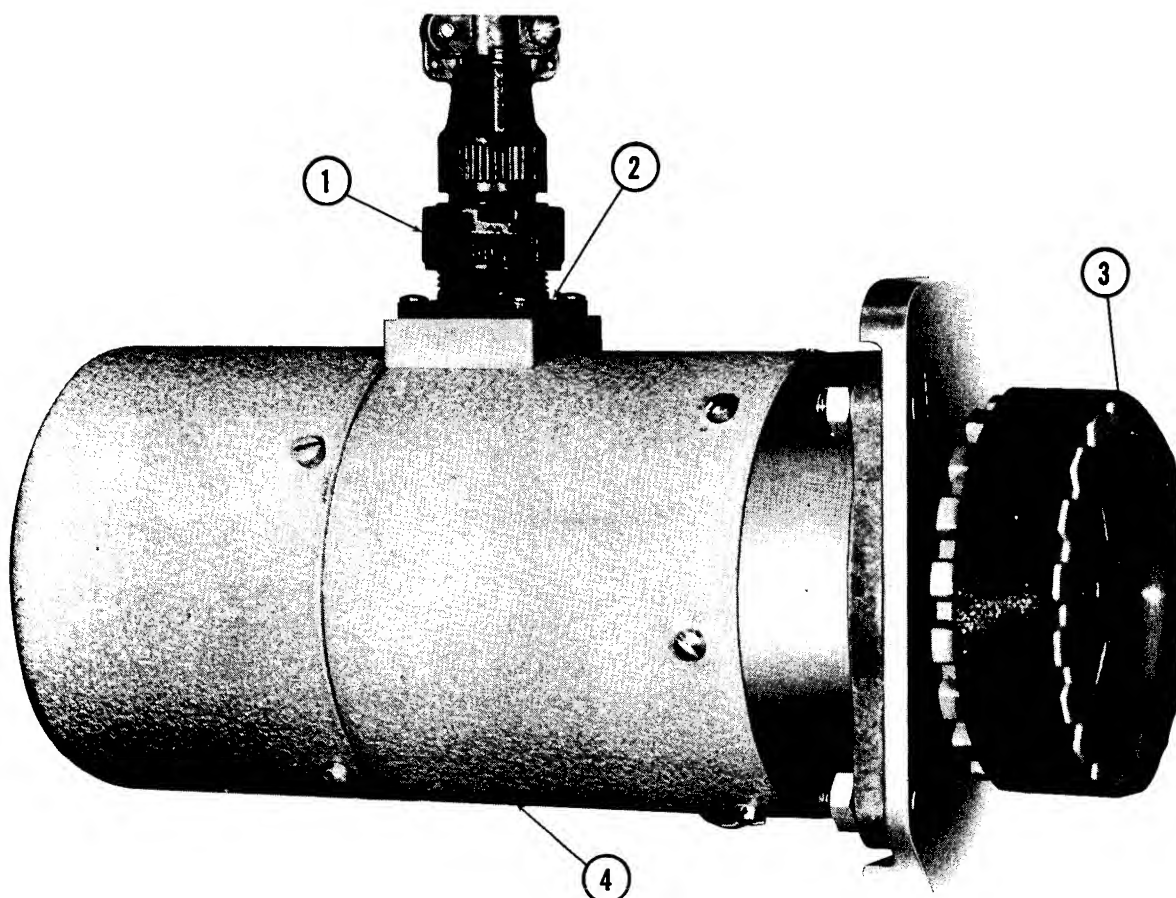
The Oblique Drive, B Configuration, in conjunction with the Optical Structure and the Programmer, provides the Model 73-B Camera Configuration with one vertical and six oblique positions. The B Configuration, unlike most camera configurations, is not installed on a rocking-type mount. The B Configuration rotates the lens cone to obtain oblique positions, instead of tilting the entire camera as is done in other systems. The seven positions of the lens cone are located 24.5 degrees apart. The distance between the extreme right oblique position and the extreme left oblique position is 147 degrees.

1-2. MAJOR COMPONENTS

The Oblique Drive consists of the following major components: a Drive Motor; a Drive Belt; a Drive Belt Idler Pulley Assembly; a Detent Brake Assembly; a Seeker Switch and Cam Assembly; two Oblique Limit Switches; a Detent Ring; an Oblique Drive Motor Mounting Bracket; a Drive Belt Pre-load Spring Assembly; and the necessary electrical wiring and connectors to complete the system.

a. Oblique Drive Motor. (See figure 1-2.) The oblique drive motor is a reversible, permanent magnet motor operating on 27.5 ± 2.5 per cent volts dc, with a normal output speed of 57 ± 2.5 per cent rpm at 25 inch-pounds of torque. Two methods of braking are used. A friction-type, magnet brake is incorporated in the drive motor to stop rotation after drive power has been removed. Dynamic braking of the drive motor is obtained through the oblique motor power relays in the programmer unit. When the power relays are de-energized they short circuit the counterelectromotive force developed by the motor after the drive power has been removed. This dynamic braking, with the braking supplied by the magnetic brake, stops the oblique motor with a minimum of

B CONFIGURATION



- 1. Motor Cable Connector
- 2. Motor Connector
- 3. Drive Pulley
- 4. Oblique Drive Motor

Figure 1-2. Oblique Drive Motor

OBLIQUE DRIVE

motor over-travel. An aluminum drive pulley is mounted on the motor shaft, and is used to drive the oblique drive belt. The motor is secured to a mounting bracket by four bolts.

b. Oblique Drive Belt. (See figure 1-3.) The oblique drive belt is a rubber, steel-corded, tooth-type unit, 0.75 inches wide, with a circumference of 75 inches. The teeth have a pitch of 0.50 inches. The drive belt is used to drive the lens cone through its oblique positions.

c. Oblique Drive Idler Pulley Assembly. (See figure 1-3.) The oblique drive idler pulley assembly consists primarily of two idler pulleys, two adjusting arms, two eccentric sleeves, and two idler pulley studs. The idler pulley assembly is used to adjust the tension on the oblique drive belt.

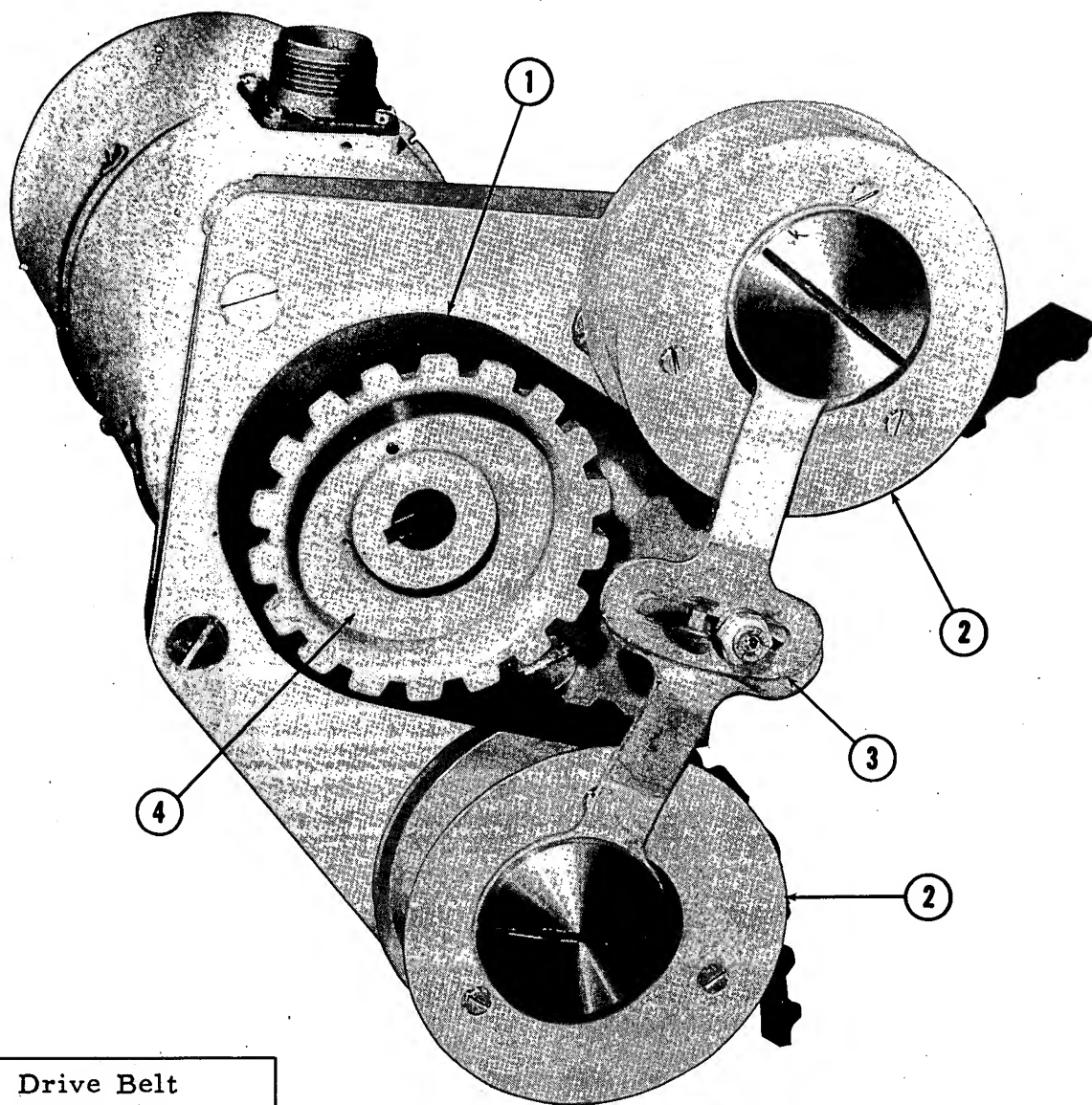
d. Detent Brake Assembly. (See figure 1-4.) The detent assembly consists of a solenoid, a brake shoe, a holding brace, a brake shoe spring, and the necessary linkage for the operation of the detent assembly. When an oblique power relay in the programmer is energized, power is supplied to the detent solenoid which, in turn, through the brake shoe linkage removes the brake shoe from the detent ring on the intermediate optical structure. The oblique drive motor is then free to drive the lens cone to the desired position. When the bridge becomes balanced, the oblique power relays are de-energized. This stops the drive motor and de-energizes the detent solenoid, allowing the brake shoe to press against the ring under the influence of the detent spring and hold the cone in position.

e. Detent Ring. (See figure 1-5.) The detent ring is an arc-shaped aluminum alloy ring which is bolted directly to the lens cone. As noted in the above paragraph, the ring acts as the pressure plate for the brake shoe.

f. Oblique Drive Motor Mounting Bracket. (See figure 1-2.) The oblique drive motor mounting bracket is an aluminum alloy bracket attached to the intermediate optical structure. The drive motor is secured to the bracket by four bolts.

g. Oblique Drive Belt Pre-load Spring Assembly. (See figure 1-4.) The pre-load spring assembly consists of a spring housing, a spring, an adjustment bolt, and a belt clamp. The pre-load spring assembly is

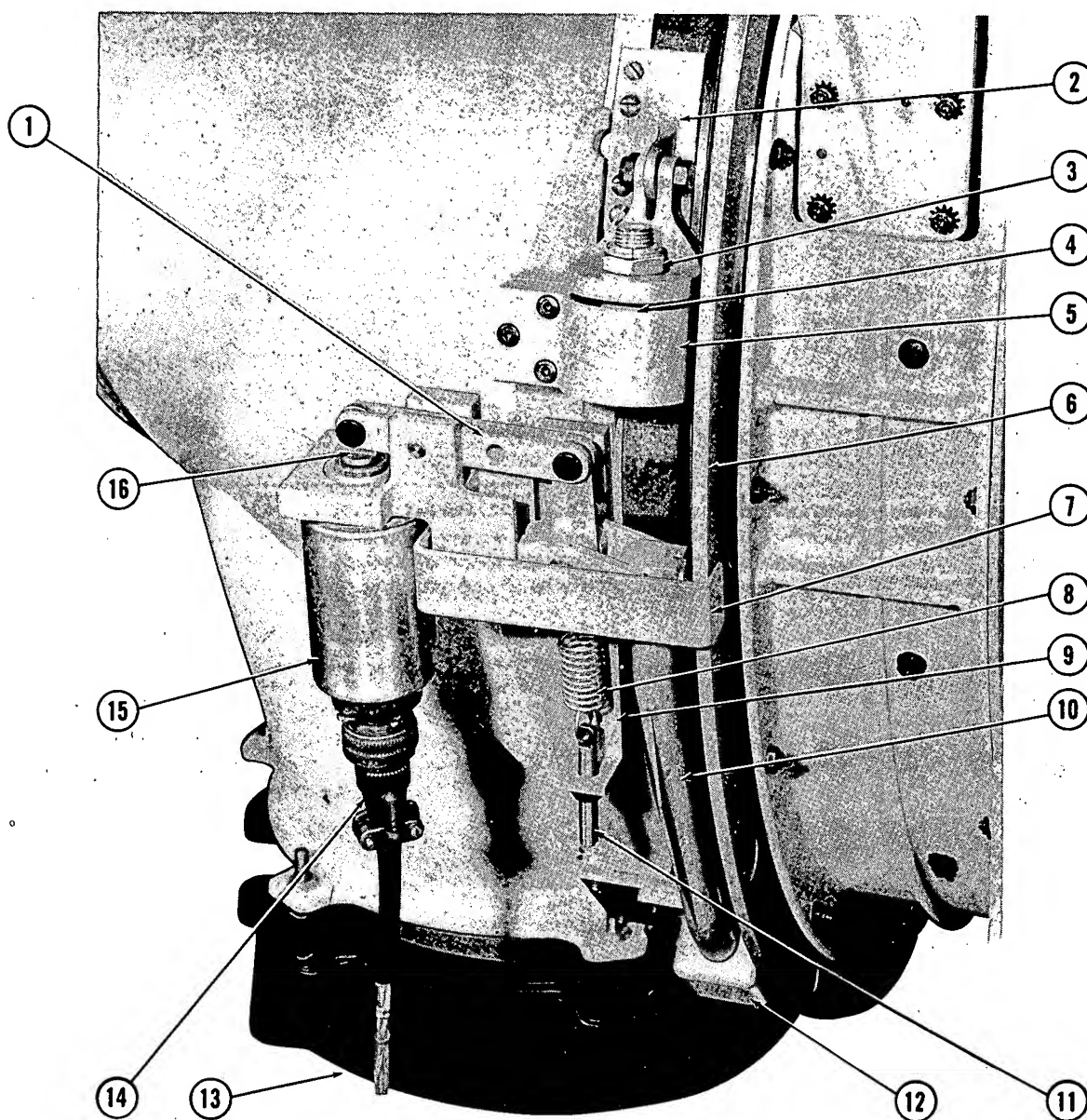
B CONFIGURATION



- 1. Drive Belt
- 2. Idler Pulleys
- 3. Adjuster Arms
- 4. Drive Pulley

Figure 1-3. Oblique Drive Idler Pulley Assembly

OBLIQUE DRIVE



- | | |
|-------------------------------------|----------------------------------|
| 1. Spring Link | 9. Spring Bracket |
| 2. Belt Clamp | 10. Latching Arm Assembly |
| 3. Adjustment Bolt and Nut | 11. Spring Bolt and Jam Nut |
| 4. Pre-Load Spring (Inside Housing) | 12. Torque Arm Bracket |
| 5. Spring Housing | 13. Lens |
| 6. Detent Ring | 14. Solenoid Connector and Cable |
| 7. Holding Brace | 15. Solenoid |
| 8. Spring | 16. Solenoid Plunger |

Figure 1-4. Detent Brake Assembly

B CONFIGURATION

used to prevent excessive slippage of the belt on the lens cone when the cone is stopping or starting.

h. Seeker Switch and Cam Assembly. (See figure 1-6.) The seeker switch and cam assembly consists of seven microswitches, a switch mounting bracket, and a fixed cam. The switches are attached to the intermediate optical structure and the cam is attached to the lens cone. Each switch is electrically connected to a resistance point on the seeker leg of the Wheatstone bridge in the programmer unit. As the lens cone moves, the cam makes and breaks the switches until the two legs of the bridge are balanced. This de-energizes the micro-positioner relay in the programmer which, in turn, de-energizes the oblique power relays, removing drive power from the oblique drive motor.

i. Oblique Limit Switches. (See figure 1-6.) Two oblique limit switches are attached to the intermediate optical structure. If the oblique drive motor does not stop at the extreme right or left oblique position, the respective limit switch will open, de-energizing the respective oblique motor power relay, removing power from the drive motor.

1-3. LEADING PARTICULARS

a. Oblique Positions.

Number of Right Oblique Positions	. . .	Mode 1.	. 3
		Mode 2.	. 1
Number of Left Oblique Positions	. . .	Mode 1.	. 3
		Mode 2.	. 1
Distance Between Each Lens Cone			
Position		24.5 degrees
Distance Between the Extreme Right			
and Left Oblique Positions	Mode 1.	. 147
			degrees
		Mode 2.	. 49
			degrees

OBLIQUE DRIVE

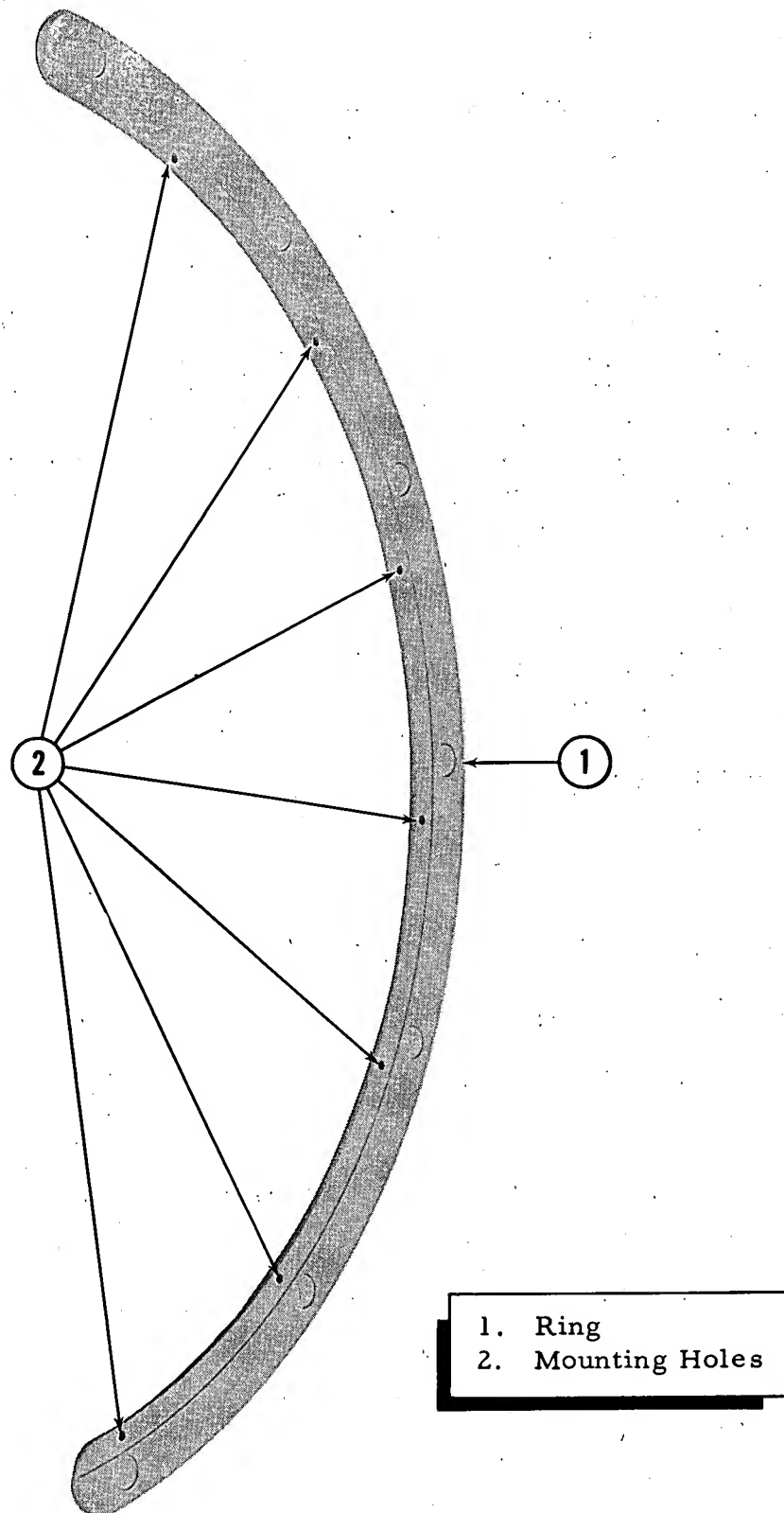


Figure 1-5. Detent Ring

B CONFIGURATION

b. Motor Data.

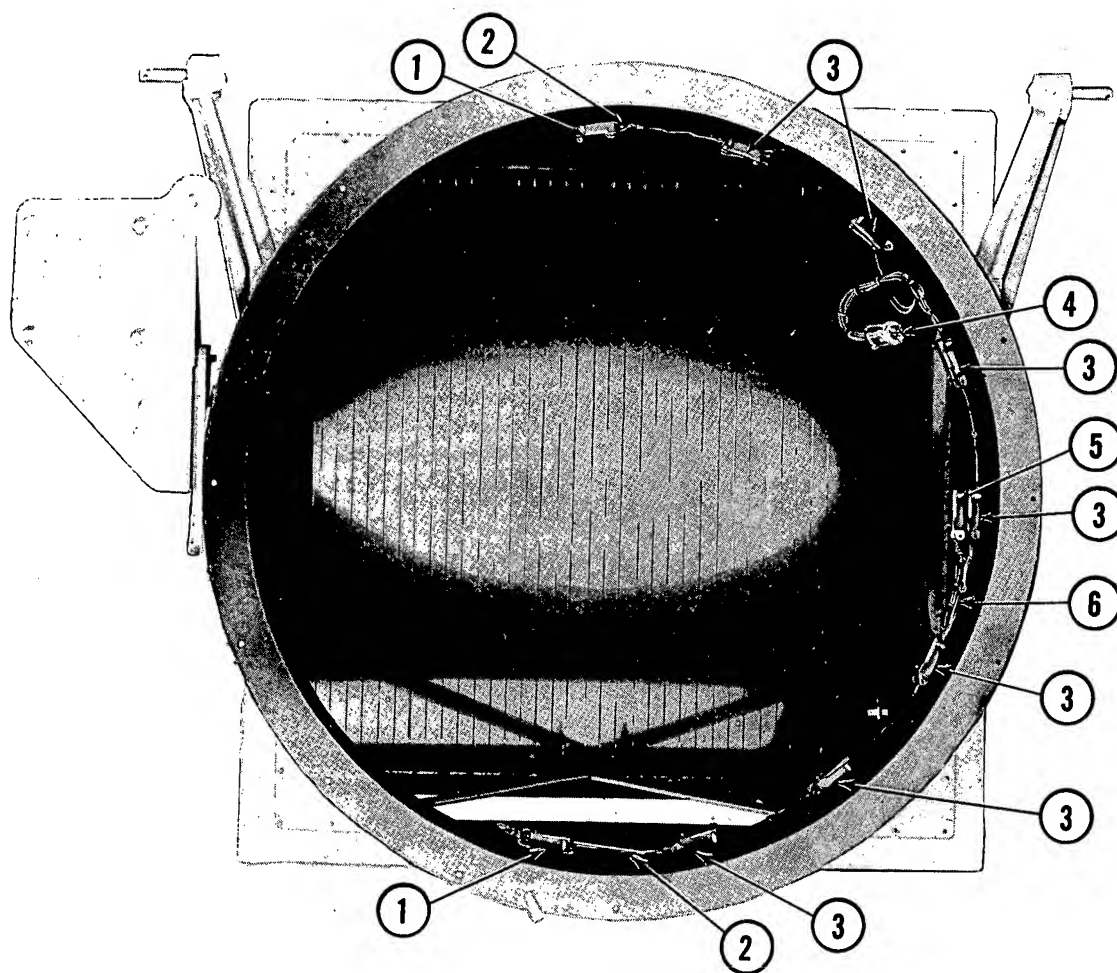
Type	Permanent Magnet
Operating Voltage	27.5 \pm 2.5 per cent dc
Operating Current	2.4 amperes dc
Output Speed	57 \pm 2.5 per cent rpm
Output Torque	25 inch-pounds

c. Solenoid Data.

Operating Voltage	27.5 \pm 2.5 per cent dc
Pull-in Current	11.0 amperes at 78 degrees F
Holding Current	0.16 amperes at 78 degrees F
Stroke	0.25-inch
Pull	21.0 pounds

d. <u>Power Requirement</u>	27 \pm 2.5 per cent dc
---------------------------------------	--------------------------

OBLIQUE DRIVE



- | | |
|--------------------------|------------------------------------|
| 1. Limit Switches | 4. Connector |
| 2. Limit Switch Brackets | 5. Vertical Indicator Light Switch |
| 3. Seeker Switches | 6. Seeker Switch Bracket |

Figure 1-6. Seeker Switch Assembly

B CONFIGURATION

OBLIQUE DRIVE

Section II

THEORY OF OPERATION

2-1. GENERAL

The information in the following paragraphs, and the electrical schematic shown in figure 2-1, are included in this section in order to help the operator trace and correct malfunctions which may be encountered during the operation of the Oblique Drive, B Configuration.

2-2. MODE 1 OPERATION

Sequencing is started by a signal from a cam-actuated command signal switch which energizes a programmer stepping switch. The position selected by the stepping switch unbalances a bridge circuit. The signal from the unbalanced bridge circuit energizes a micro-positioner relay in a direction with respect to the polarity of the signal, which in turn energizes the appropriate oblique motor power relay. The energized oblique power relay supplies 28 volts dc from a cam-actuated oblique motor brake and detent switch to a detent solenoid, removing the brake shoe from the detent ring; and to an oblique drive motor magnetic brake which disengages. A split-second later the power oblique relay applies 28 volts dc to the drive motor, driving the motor in the desired direction. When the camera reaches the desired oblique position, the seeker bridge leg switches connect the proper resistance, balancing the bridge circuit and stopping the oblique drive motor. If the drive motor fails to stop at the desired oblique position, the lens cone will continue to move until the respective oblique limit switch is opened. This will remove the input voltage to the oblique power relay, de-energizing the relay. When the oblique power relay is de-energized, it removes power from the oblique motor magnetic brake, causing the brake to become engaged, and removes power from the detent solenoid, engaging the brake shoe, and also provides dynamic braking of the oblique drive motor by shorting the motor armature. The system is now ready to be advanced to the next oblique operation. See figure 2-2 for a complete sequencing of Mode 1.

B CONFIGURATION



OBLIQUE DRIVE

2-3. MODE 2 OPERATION

Mode 2 operation is exactly the same as that of Mode 1, except for the oblique sequence. See figure 2-3 for Mode 2 sequencing.

B CONFIGURATION

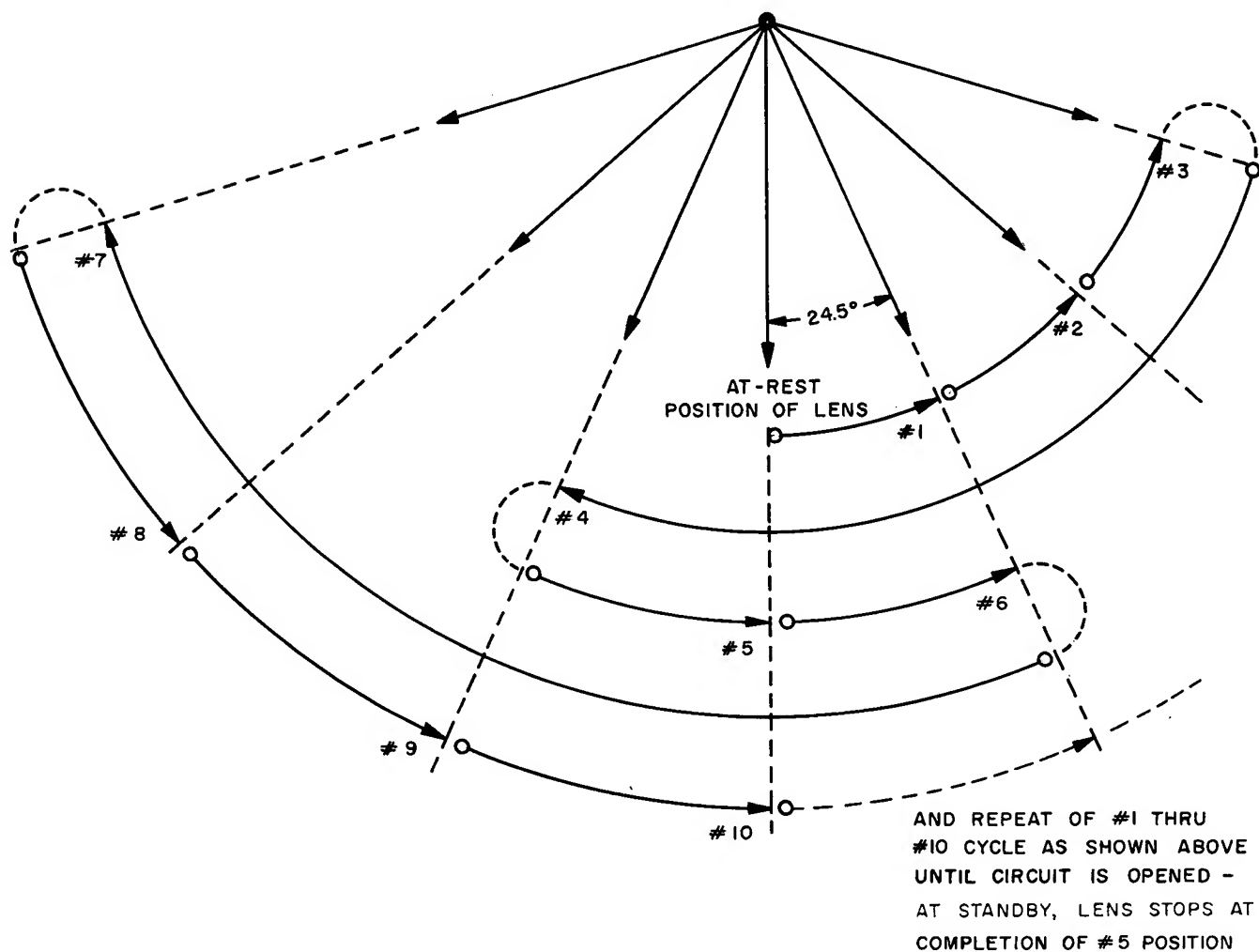


Figure 2-2. Mode 1 Oblique Sequence Chart

OBLIQUE DRIVE

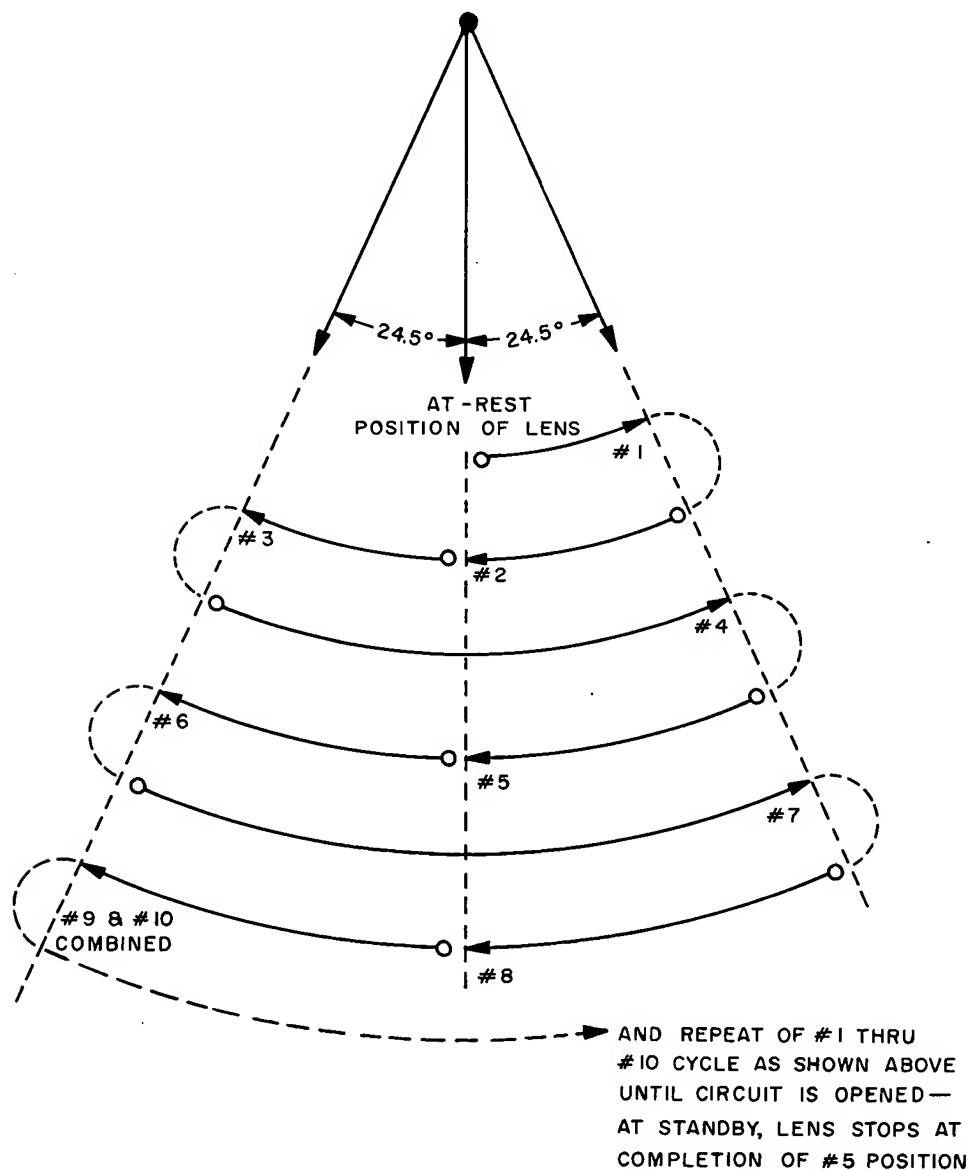


Figure 2-3. Mode 2 Oblique Sequence Chart

B CONFIGURATION

OBLIQUE DRIVE

Section III

PREPARATION FOR OPERATION

3-1. GENERAL

No special preparation is required to place the Oblique Drive, B Configuration, in operation except for a check to see that there is no slack in the oblique drive belt, a general check for tightness of electrical connections, and a visual check of system components.

B CONFIGURATION

OBLIQUE DRIVE

Section IV

MAINTENANCE

4-1. GENERAL

Maintenance of the Oblique Drive, B Configuration, consists of visual checks and periodic inspections to insure proper operation of the system.

4-2. SPECIAL TOOLS

No special tools are required to maintain the oblique drive system.

4-3. LUBRICATION

The oblique drive system is lubricated at time of assembly and should require no further lubrication in the field.

4-4. PERIODIC INSPECTION

No periodic inspection information is available at this time.

B CONFIGURATION

OBLIQUE DRIVE

Section V

OVERHAUL

5-1. GENERAL

The Oblique Drive, B Configuration, must not be overhauled in the field. If a malfunction should occur, the configuration should be returned to the factory for overhaul.

B CONFIGURATION

OBLIQUE DRIVE

Section VI

PARTS LIST

PART NO.	PART NAME	UNITS PER ASSEMBLY
32-ODBC-730175-20020	SCREW, Set	1
32-ODBC-730175-20022	SCREW, Set	1
32-ODBC-730175-20160	SCREW, Fil Hd	2
32-ODBC-730175-20473	SCREW, Nylock	2
32-ODBC-730175-20906	SCREW, Flat Hd	6
32-ODBC-730175-20907	SCREW	3
32-ODBC-730180-20056	NUT, Lock	3
32-ODBC-730180-20083	NUT	1
32-ODBC-730184-20184	WASHER, Lock	2
32-ODBC-730184-20526	WASHER, Lock	6
32-ODBC-730185-20078	PIN, Roll	2
32-ODBC-730187-20057	RING, Retaining	1
32-ODBC-732731	BEARING	1
32-ODBC-737602-20004	BELT	1
32-ODBC-737612-1	ARM, Adjusting	1
32-ODBC-737612-2	ARM, Adjusting	1
32-ODBC-737613	ARM, Solenoid	1
32-ODBC-737614	SPRING	1
32-ODBC-737615	BRACKET, Spring	1
32-ODBC-737617	STUD, Idler Pulley	2
32-ODBC-737618	LINK, Spring	1
32-ODBC-737619	BODY, Idler Pulley	2
32-ODBC-737620	BEARING	2
32-ODBC-737621	FLANGE	2
32-ODBC-737622	PLATE, Friction	1
32-ODBC-737623	IDLER PULLEY ASSY.	2
32-ODBC-737624	SPACER, Adjust Bolt	1
32-ODBC-737625	BOLT, Adjust Arm Assy	1
32-ODBC-737626	FORK	1
32-ODBC-737627	GRIP	1
32-ODBC-737628	BASE, Mounting	1

B CONFIGURATION

PART NO.	PART NAME	UNITS PER ASSEMBLY
32-ODBC-737629-1	SHIM, Brace	4
32-ODBC-737629-2	SHIM, Brace	2
32-ODBC-737630	CLAMP, Arm	1
32-ODBC-737631	RING ASSY	1
32-ODBC-737632	BUSHING	7
32-ODBC-737633	SLEEVE, Eccentric	2
32-ODBC-737634	BRACKET, Torque Arm	1
32-ODBC-737635	ARM ASSY, Latching	1
32-ODBC-737636	SPACER, Arm Latch	As req.
32-ODBC-737636-2	SPACER, Arm Latch	As req.
32-ODBC-737637	PIN, Latch Arm	1
32-ODBC-737638	ARM, Sub Assy.	1
32-ODBC-737638-3	PIN	1
32-ODBC-737638-5	GUSSET	1
32-ODBC-737638-7	BLOCK	1
32-ODBC-737638-9	TUBE	1
32-ODBC-737639	SLUG, Arm Latch	3
32-ODBC-737640	PIN	2
32-ODBC-737641	BRACKET, Mounting	1
32-ODBC-737642	BRACE, Holding	1
32-ODBC-737643	RING	1
32-ODBC-737644	LINK, Top	1
32-ODBC-737645	LINK, Bottom	1
32-ODBC-737646	LINK	1
32-ODBC-737647	PIN, Bracket	1
32-ODBC-737649	BOLT, Eye	1
32-ODBC-737650	BELT CLAMP ASSY	1
32-ODBC-737651	BOLT, Spring	1
32-ODBC-737652	PULLEY, Drive	1
32-ODBC-737654	CLAMP, Arm, Sub Assy	1
32-ODBC-737655	SPACER, Arm Clamp	1
32-ODBC-737656	MATCHED FRILL ASSY	1
32-ODBC-737657	DISC, Spring	14
32-ODBC-737658	SPACER, Spring Int	3
32-ODBC-737659	SPACER, Spring Ext	3
32-ODBC-737660	SPRING, Preload Assy	1
32-ODBC-737661	SPACER	2
32-ODBC-737662	PIN, Drilled	1

OBLIQUE DRIVE

PART NO.	PART NAME	UNITS PER ASSEMBLY
32-ODBC-737663	WASHER, Adjust	1
32-ODBC-737664	HOUSING	1
32-ODBC-737665	BALL, Chrome Steel	1
32-ODBC-737666	LINK	1
32-ODBC-737667	BOLT	1
32-ODBC-737668	BOLT, Link Attaching	1